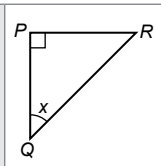
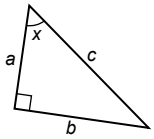
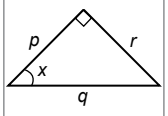
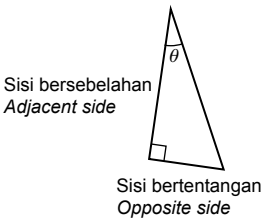
JAWAPAN

BAB 5 Nisbah Trigonometri
Trigonometric Ratios

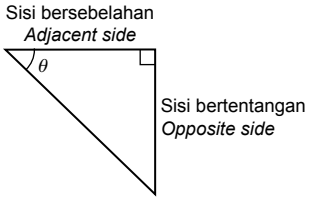
1.

Segi tiga bersudut tegak *Right-angled triangle*			
Sisi bertentangan *Opposite side*	*PR*	*b*	*r*
Sisi bersebelahan *Adjacent side*	*PQ*	*a*	*p*

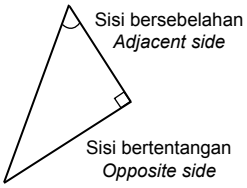
2. (a)



(b)



(c)



3. (a)

Segi tiga/ *Triangle*		*PST*	*PUV*	*PWX*
Nisbah panjang/ *Ratio of length*	$\frac{\text{sisi bertentangan}}{\text{hipotenus}}$ $\frac{\textit{opposite side}}{\textit{hypotenuse}}$	$\frac{8}{10}=\frac{4}{5}$	$\frac{12}{15}=\frac{4}{5}$	$\frac{16}{20}=\frac{4}{5}$
	$\frac{\text{sisi bersebelahan}}{\text{hipotenus}}$ $\frac{\textit{adjacent side}}{\textit{hypotenuse}}$	$\frac{6}{10}=\frac{3}{5}$	$\frac{9}{15}=\frac{3}{5}$	$\frac{12}{20}=\frac{3}{5}$
	$\frac{\text{sisi bertentangan}}{\text{sisi bersebelahan}}$ $\frac{\textit{opposite side}}{\textit{adjacent side}}$	$\frac{8}{6}=\frac{4}{3}$	$\frac{12}{9}=\frac{4}{3}$	$\frac{16}{12}=\frac{4}{3}$

(b) (i) Dalam segi tiga bersudut tegak yang serupa, nisbah panjang sisi yang sepadan adalah tetap.

In similar right-angled triangles, the ratios of corresponding sides are constant.

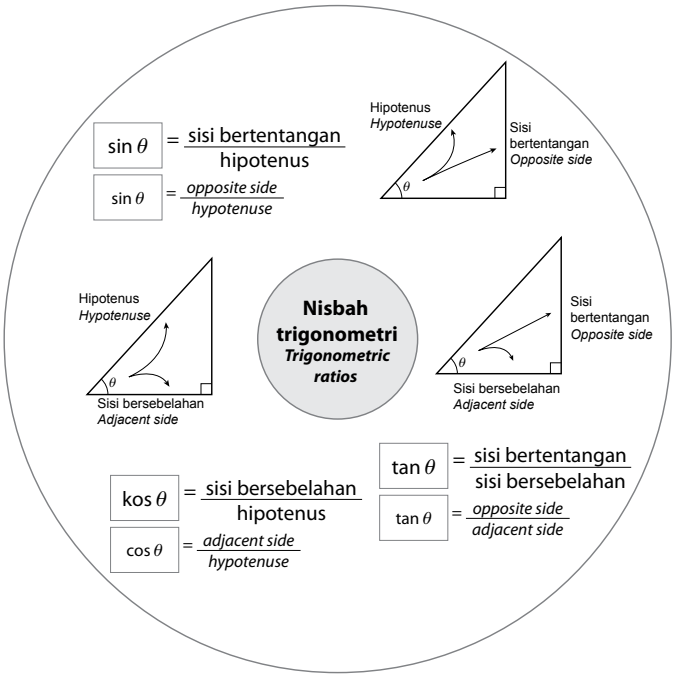
(ii) Nisbah ini tidak berubah apabila saiz segi tiga berubah secara berkadaran.

These ratios do not change when the size of the triangle varies proportionally.

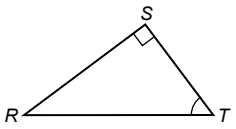
(iii) Nisbah panjang pasangan sisi suatu segi tiga bersudut tegak dikenali sebagai nisbah trigonometri.

The ratios between pairs of side lengths in right-angled triangles are called trigonometric ratios.

4.

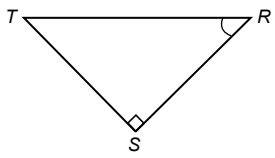


5. (a)



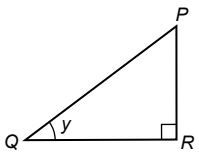
$\frac{RS}{ST}$	sin $\angle T$
$\frac{ST}{RT}$	kos $\angle T$ / cos $\angle T$
$\frac{RS}{RT}$	tan $\angle T$

(b)



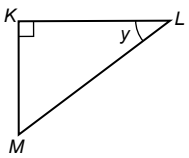
$\frac{ST}{RS}$	sin $\angle R$
$\frac{RS}{RT}$	kos $\angle R$ / cos $\angle R$
$\frac{ST}{RT}$	tan $\angle R$

6. (a)



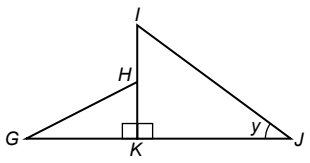
$\text{kos } y = \frac{QR}{PQ}$

(b)



$\tan y = \frac{KM}{KL}$

(c)



$\sin y = \frac{IHK}{IJ}$

7. (a)

Segi tiga *Triangle*	Sudut tirus *Acute angle*	Nisbah panjang (kepada dua tempat perpuluhan) *Ratio of length (to two decimal places)*		
		$\frac{\text{sisi bertentangan}}{\text{hipotenus}}$ *opposite side / hypotenuse*	$\frac{\text{sisi bersebelahan}}{\text{hipotenus}}$ *adjacent side / hypotenuse*	$\frac{\text{sisi bertentangan}}{\text{sisi bersebelahan}}$ *opposite side / adjacent side*
DEF	50°	$\frac{7.7}{10} = 0.77$	$\frac{6.4}{10} = 0.64$	$\frac{7.7}{6.4} = 1.20$
GHJ	70°	$\frac{9.4}{10} = 0.94$	$\frac{3.4}{10} = 0.34$	$\frac{9.4}{3.4} = 2.76$

(b)
- nilai sinus bagi sudut itu (berkurang, bertambah)
  the value of sine of the angle (*decreases, increases*)
- nilai kosinus bagi sudut itu (berkurang, bertambah)
  the value of cosine of the angle (*decreases* , *increases*)
- nilai tangen bagi sudut itu (berkurang, bertambah)
  the value of tangent of the angle (*decreases, increases*)

8. (a)

sin 53°	sin 28°	sin 45°	sin 90°	sin 16°	sin 37°
sin 16°	sin 28°	sin 37°	sin 45°	sin 53°	sin 90°

(b)

kos 21° / cos 21°	kos 64° / cos 64°	kos 8° / cos 8°	kos 0° / cos 0°	kos 77° / cos 77°	kos 90° / cos 90°
kos 90° / cos 90°	kos 77° / cos 77°	kos 64° / cos 64°	kos 21° / cos 21°	kos 8° / cos 8°	kos 0° / cos 0°

(c)

tan 59°	tan 88°	tan 0°	tan 75°	tan 34°	tan 17°
tan 0°	tan 17°	tan 34°	tan 59°	tan 75°	tan 88°

9. (a) (i) $\sin w = \frac{3}{5}$

(ii) $\underset{\cos w}{\text{kos}}\, w = \frac{4}{5}$

(iii) $\tan w = \frac{3}{4}$

(iv) $\sin x = \frac{5}{13}$

(v) $\underset{\cos x}{\text{kos}}\, x = \frac{12}{13}$

(vi) $\tan x = \frac{5}{12}$

(vii) $\sin y = \frac{8}{17}$

(viii) $\underset{\cos y}{\text{kos}}\, y = \frac{15}{17}$

(ix) $\tan y = \frac{8}{15}$

(x) $\sin z = \frac{10}{26} = \frac{5}{13}$

(xi) $\underset{\cos z}{\text{kos}}\, z = \frac{24}{26} = \frac{12}{13}$

(xii) $\tan z = \frac{10}{24} = \frac{5}{12}$

(b) Δ*DEF* dan Δ*LMN* adalah berkadaran. Nisbah trigonometri bagi sudut *x* dan sudut *z* adalah sama.
ΔDEF and ΔLMN are proportional. The trigonometric ratios of the angle x and angle z are equal.

10. (a) $\sin\theta = \frac{5}{13}$

(b) $\sin\theta = \frac{9}{41}$

(c) $\sin\theta = \frac{21}{29}$

(d) $BC = \sqrt{25^2 - 24^2}$
$= 7 \text{ cm}$
$\sin\theta = \frac{7}{25}$

(e) $QR = \sqrt{17^2 - 8^2}$
$= 15 \text{ cm}$
$\sin\theta = \frac{15}{17}$

11. (a) $\underset{\cos\theta}{\text{kos}}\,\theta = \frac{15}{17}$

(b) $KM = \sqrt{15^2 + 8^2}$
$= 17 \text{ cm}$
$\underset{\cos\theta}{\text{kos}}\,\theta = \frac{15}{17}$

(c) $SQ = \sqrt{13^2 - 12^2}$
$= 5 \text{ cm}$
$\underset{\cos\theta}{\text{kos}}\,\theta = \frac{5}{10}$
$= \frac{1}{2}$

(d) $AC = \sqrt{25^2 - 24^2}$
$= 7 \text{ cm}$
$\underset{\cos\theta}{\text{kos}}\,\theta = \frac{7}{25}$

(e) $KH = \sqrt{13^2 - 5^2} = 12 \text{ cm}$
$KI = KH + HI = 24 \text{ cm}$
$JI = \sqrt{7^2 + 24^2} = 25 \text{ cm}$
$\underset{\cos\theta}{\text{kos}}\,\theta = \frac{24}{25}$

12. (a) $\tan\theta = \frac{12}{9}$
$= \frac{4}{3}$

(b) $QR = \sqrt{13^2 - 5^2}$
$= 12 \text{ cm}$
$\tan\theta = \frac{12}{5}$

(c) $LM = \sqrt{17^2 - 15^2}$
$= 8 \text{ cm}$
$\tan\theta = \frac{8}{15}$

(d) $KL = \sqrt{0.41^2 - 0.40^2}$
$= 0.09 \text{ m}$
$\tan\theta = \frac{0.40}{0.09}$
$= \frac{40}{9}$

(e) $PR = QR$
$= 8 \text{ cm}$
$\tan\theta = \frac{8}{8}$
$= 1$

14. (a) $\tan\theta = \frac{0.28}{0.96}$

$= \frac{7}{24}$

(b) $\tan\theta = \frac{\frac{\sqrt{51}}{10}}{\frac{7}{10}}$

$= \frac{\sqrt{51}}{7}$

15. (a) $\sin x = \frac{5}{6}$

$\frac{15}{y} = \frac{5}{6}$

$y = 18$

(b) $\sin x = \frac{4}{9}$

$\frac{y}{18} = \frac{4}{9}$

$y = 8$

(c) $\text{kos}\, x = \frac{5}{8}$ $(\cos x = \frac{5}{8})$

$\frac{15}{y} = \frac{5}{8}$

$y = 24$

(d) $\text{kos}\, x = \frac{3}{11}$ $(\cos x = \frac{3}{11})$

$\frac{y}{33} = \frac{3}{11}$

$y = 9$

(e) $\tan x = \frac{3}{5}$

$\frac{y}{20} = \frac{3}{5}$

$y = 12$

(f) $\tan x = \frac{8}{9}$

$\frac{16}{y} = \frac{8}{9}$

$y = 18$

16. (a) $\text{kos}\, x = \frac{24}{PR}$ $(\cos x = \frac{24}{PR})$

$0.96 = \frac{24}{PR}$

$PR = 25$ cm

$QR = \sqrt{25^2 - 24^2}$

$= 7$ cm

(i) $\sin x = \frac{7}{25}$

(ii) $\tan x = \frac{7}{24}$

(b) $\tan x = \frac{TU}{16}$

$\frac{TU}{16} = \frac{3}{4}$

$TU = 12$ cm

$SU = \sqrt{16^2 + 12^2}$

$= 20$ cm

(i) $\sin x = \frac{12}{20}$

$= \frac{3}{5}$

(ii) $\text{kos}\, x = \frac{16}{20}$ $(\cos x = \frac{16}{20})$

$= \frac{4}{5}$

(c) $\sin\theta = \frac{9}{BD}$

$\frac{3}{8} = \frac{9}{BD}$

$BD = 24$ cm

$AD = \sqrt{25^2 - 24^2}$

$= 7$ cm

(i) $\tan x = \frac{24}{7}$

(ii) $\text{kos}\, x = \frac{7}{25}$ $(\cos x = \frac{7}{25})$

(d) $\tan y = \frac{KN}{8}$

$\frac{KN}{8} = 1$

$KN = 8$ cm

$MN = \sqrt{17^2 - 8^2}$

$= 15$ cm

$\tan \angle MKN = \frac{15}{8}$

17. (a) (i) $BC = \sqrt{10^2 - 6^2}$
$= 8$ cm

$\text{kos } x = \frac{BC}{BD}$ $(\cos x = \frac{BC}{BD})$
$= \frac{8}{10}$
$= \frac{4}{5}$

(ii) $AC = 2 \times 8$
$= 16$ cm
$\tan y = \frac{DC}{AC}$
$= \frac{6}{16}$
$= \frac{3}{8}$

(b) (i) $\text{kos } x = \frac{AC}{17}$ $(\cos x = \frac{AC}{17})$
$\frac{AC}{17} = \frac{15}{17}$
$AC = 15$ cm
$AD = \sqrt{17^2 - 15^2}$
$= 8$ cm
$\tan x = \frac{AD}{AC}$
$= \frac{8}{15}$

(ii) $BC = \sqrt{15^2 - 12^2}$
$= 9$ cm
$\sin y = \frac{BC}{AC}$
$= \frac{9}{15}$
$= \frac{3}{5}$

(c) (i) $JM = \sqrt{13^2 - 5^2}$
$= 12$ cm
$\sin x = \frac{JM}{NJ}$
$= \frac{12}{13}$

(ii) $MK = \sqrt{37^2 - 12^2}$
$= 35$ cm
$\tan y = \frac{MK}{JM}$
$= \frac{35}{12}$

(d) (i) $\text{kos } y = \frac{QS}{17}$ $(\cos y = \frac{QS}{17})$
$\frac{QS}{17} = \frac{15}{17}$
$QS = 15$ cm
$QR = \sqrt{17^2 - 15^2}$
$= 8$ cm
$PR = 2 \times 8$
$= 16$ cm

(ii) $QT = 15 - 9$
$= 6$ cm
$PT = \sqrt{8^2 + 6^2}$
$= 10$ cm
$\sin x = \frac{QT}{PT}$
$= \frac{6}{10}$
$= \frac{3}{5}$

(e) (i) $\sin y = \frac{BE}{17}$
$\frac{BE}{17} = \frac{15}{17}$
$BE = 15$ cm
$DE = 6 + 15$
$= 21$ cm

(ii) $\tan x = \frac{6}{BC}$
$\frac{6}{BC} = \frac{3}{4}$
$BC = 8$ cm
$CD = \sqrt{6^2 + 8^2}$
$= 10$ cm
$\sin x = \frac{BD}{CD}$
$= \frac{6}{10} = \frac{3}{5}$

(f) (i) $BD = \sqrt{13^2 - 5^2}$
$= 12$ cm
$BE = 2 \times 12$
$= 24$ cm
$AB = \sqrt{25^2 - 24^2}$
$= 7$ cm
$AC = AB + BC$
$= 7 + 5$
$= 12$ cm

(ii) $\tan x = \frac{AB}{BE}$

$= \frac{7}{24}$

(iii) $\text{kos } y = \frac{BD}{CD}$ $(\cos y = \frac{BD}{CD})$

$= \frac{12}{13}$

18.

sin 30°	kos 45° / cos 45°	tan 60°	sin 60°	kos 30° / cos 30°	tan 45°	sin 45°	tan 30°
as	as	as	as	as	as	as	as
$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\sqrt{3}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{2}$	1	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{3}}$

19. (a) $\sin 45° + \text{kos } 45°$

$\sin 45° + \cos 45°$

$= \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}$

$= \frac{2}{\sqrt{2}} = \sqrt{2}$ ← $\frac{2}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}}{2} = \sqrt{2}$

(b) $\text{kos } 60° + \tan 45°$

$\cos 60° + \tan 45°$

$= \frac{1}{2} + 1$

$= 1\frac{1}{2}$

(c) $2 \sin 60° - \tan 60°$

$= 2\left(\frac{\sqrt{3}}{2}\right) - \sqrt{3}$

$= \sqrt{3} - \sqrt{3}$

$= 0$

(d) $3 \text{ kos } 30° - \sin 60°$

$3 \cos 30° - \sin 60°$

$= 3\left(\frac{\sqrt{3}}{2}\right) - \frac{\sqrt{3}}{2}$

$= 2\left(\frac{\sqrt{3}}{2}\right)$

$= \sqrt{3}$

(e) $(2 \text{ kos } 30°)(4 \tan 45°) + \tan 60°$

$(2 \cos 30°)(4 \tan 45°) + \tan 60°$

$= 2\left(\frac{\sqrt{3}}{2}\right)(4)(1) + \sqrt{3}$

$= 4\sqrt{3} + \sqrt{3}$

$= 5\sqrt{3}$

(f) $\frac{2 \text{ kos } 30°}{\tan 30°} - \text{kos } 60° / \frac{2 \cos 30°}{\tan 30°} - \cos 60°$

$= \frac{2\left(\frac{\sqrt{3}}{2}\right)}{\frac{1}{\sqrt{3}}} - \frac{1}{2}$

$= \sqrt{3} \times \sqrt{3} - \frac{1}{2}$

$= 3 - \frac{1}{2}$

$= 2\frac{1}{2}$

(g) $(3 \sin 45°)(4 \tan 30°) - (2 \text{ kos } 30°)(2 \sin 60°)$

$(3 \sin 45°)(4 \tan 30°) - (2 \cos 30°)(2 \sin 60°)$

$= 3\left(\frac{1}{\sqrt{2}}\right)(4)\left(\frac{1}{\sqrt{3}}\right) - 2\left(\frac{\sqrt{3}}{2}\right)(2)\left(\frac{\sqrt{3}}{2}\right)$

$= \frac{12}{\sqrt{6}} - \frac{12}{4}$ ← $\frac{12}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{12\sqrt{6}}{6} = 2\sqrt{6}$

$= 2\sqrt{6} - 3$

20. (a) 73.3°

$= 73° + 0.3°$

$= 73° + (0.3 \times 60)'$

$= 73° + 18'$

$= 73°18'$

(b) 42.6°

$= 42° + 0.6°$

$= 42° + (0.6 \times 60)'$

$= 42° + 36'$

$= 42°36'$

(c) 39.85°

$= 39° + 0.85°$

$= 39° + (0.85 \times 60)'$

$= 39° + 51'$

$= 39°51'$

21. (a) 46°9'

$= 46° + 9'$

$= 46° + \left(\frac{9}{60}\right)°$

$= 46° + 0.15°$

$= 46.15°$

(b) 77°36'

$= 77° + 36'$

$= 77° + \left(\frac{36}{60}\right)°$

$= 77° + 0.6°$

$= 77.6°$

(c) $15°12'$
$= 15° + 12'$
$= 15° + \left(\frac{12}{60}\right)°$
$= 15° + 0.2°$
$= 15.2°$

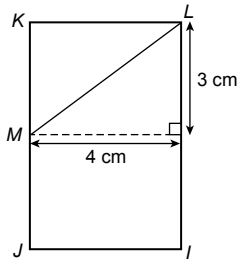
22. (a) kos 46.2°/ cos 46.2°
$= 0.6921$
(b) tan 81°36′
$= 6.7720$
(c) sin 36.7°
$= 0.5976$
(d) sin 52°24′
$= 0.7923$
(e) kos 65.7°/ cos 65.7°
$= 0.4115$
(f) tan 49°53′
$= 1.1868$
(g) kos 77°43′/ cos 77°43′
$= 0.2127$
(h) tan 24°7′
$= 0.4477$

23. (a) $\sin\theta = 0.69$
$\theta = \sin^{-1}(0.69)$
$= 43°38'$
(b) kos $\theta = 0.92$
$\cos\theta = 0.92$
$\theta = \text{kos}^{-1}(0.92)$
$\cos^{-1}(0.92)$
$= 23°4'$
(c) $\sin\theta = 0.83$
$\theta = \sin^{-1}(0.83)$
$= 56°6'$
(d) kos $\theta = 0.17$
$\cos\theta = 0.17$
$\theta = \text{kos}^{-1}(0.17)$
$\cos^{-1}(0.17)$
$= 80°13'$
(e) $\tan\theta = 3$
$\theta = \tan^{-1}(3)$
$= 71°34'$
(f) $\tan\theta = 0.74$
$\theta = \tan^{-1}(0.74)$
$= 36°30'$
(g) $\sin\theta = 0.45$
$\theta = \sin^{-1}(0.45)$
$= 26°45'$
(h) kos $\theta = 0.55$
$\cos\theta = 0.55$
$\theta = \text{kos}^{-1}(0.55)$
$\cos^{-1}(0.55)$
$= 56°38'$

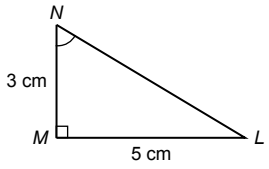
24. (a) $\sin 45° = \frac{PQ}{7}$
$\frac{PQ}{7} = \frac{1}{\sqrt{2}}$
$PQ = \frac{1}{\sqrt{2}} \times 7$
$= 4.95$ m
Lebar lebuh raya ialah 4.95 m.
The width of the highway is 4.95 m.

(b) $\tan\theta = \frac{1.5}{2.6}$
$\theta = \tan^{-1}(0.5769)$
$= 30°$

(c)

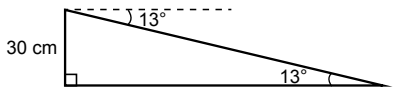


$ML = \sqrt{3^2 + 4^2}$
$= \sqrt{25}$
$= 5$ cm



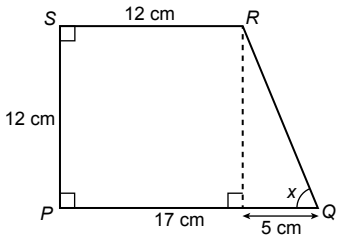
$\tan\angle MNL = \frac{5}{3}$
$\angle MNL = \tan^{-1}\left(\frac{5}{3}\right)$
$= 59.04°$
$= 59°2'$

(d) $\tan 13° = \frac{25}{\text{Jarak/ } \textit{Distance}}$
Jarak/ *Distance* $= \frac{25}{\tan 13°}$
$= 108.3$ cm



(e) (i) $\tan x = \frac{12}{5}$

(ii) $QR = \sqrt{5^2 + 12^2}$
$= 13$ cm
$\sin x = \frac{12}{13}$



Power PT3

Bahagian A

1. kos θ – sin θ
cos θ – sin θ

$= \frac{15}{17} - \frac{8}{17}$

Jawapan/ *Answer*: **A**

2. **A** $\frac{QR}{PQ} = \frac{1.5}{2} = \frac{3}{4}$

B $\frac{QR}{PQ} = \frac{3}{4}$

C $\frac{QR}{PQ} = \frac{6}{5} \neq \frac{3}{4}$

D $\frac{QR}{PQ} = \frac{6}{8} = \frac{3}{4}$

Jawapan/ *Answer*: **C**

3. $\frac{5}{13} = \frac{10}{PR}$

$PR = 26$

Jawapan/ *Answer*: **D**

4. kos $\angle PRQ = \frac{21}{29} = 0.7241$ $(\cos \angle PRQ = \frac{21}{29} = 0.7241)$

sin $\angle PRQ = \frac{20}{29} = 0.6897$

sin $\angle QPR = \frac{21}{29} = 0.7241$

tan $\angle QPR = \frac{21}{20} = 1.05$

Jawapan/ *Answer*: **D**

Bahagian B

5. (a)

	Nisbah trigonometri *Trigonometric ratios*	Nilai θ *Value of* θ
(i)	sin $\theta = 0.1773$	10°13′
(ii)	kos $\theta = 0.4216$ cos $\theta = 0.4216$	65°4′
(iii)	tan $\theta = 0.7852$	38°8′

(b) *PQR* ialah segi tiga sama sisi, maka $\theta = 60°$.
PQR is an equilateral triangle, hence $\theta = 60°$.

kos θ = kos 60°

cos θ = cos 60°

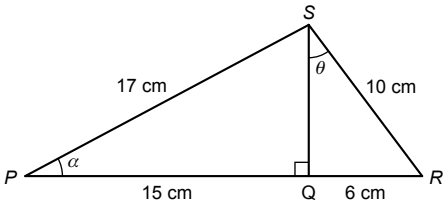
= 0.5

6. (a)

$\theta = \tan^{-1} \frac{18}{27}$

$= 33.69° / 33°41′$

(b)



Bahagian C

7. (a) kos $\angle PRQ = \frac{12}{PR}$

$\frac{4}{5} = \frac{12}{PR}$

$PR = 15$ cm

$RS = \sqrt{8^2 + 15^2}$

$= 17$ cm

sin $\theta = \frac{15}{17}$

(b) tan $\angle TPQ = \frac{21}{20}$

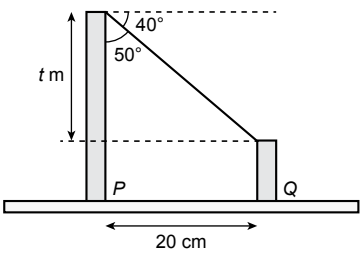
$\frac{63}{20 + QR} = \frac{21}{20}$

$\frac{3}{20 + QR} = \frac{1}{20}$

$60 = 20 + QR$

$QR = 40$ cm

(c)



tan 50° $= \frac{20}{t}$

$t = \frac{20}{\tan 50°}$

$= 16.78$ m

Tinggi bangunan *Q* / *Height of building Q*
= 24.5 – 16.78
= 7.72 m

8. (a) (i) $\frac{12}{13} = \frac{12}{PR}$

$PR = 13$ cm

$QR = \sqrt{13^2 - 12^2}$

$= 5$ cm

(ii) $\tan \angle PSQ = \frac{12}{2 \times 5}$

$= \frac{6}{5}$

(b) $\theta = \angle SPQ - \angle RPQ$

$= \tan^{-1}\frac{12}{18} - \tan^{-1}\frac{6}{18}$

$= 33°41' - 18°26'$

$= 15°15'$

(c) $PR = \sqrt{25^2 - 7^2}$

$= 24$ cm

$TR = \frac{2}{3} \times 24$

$= 16$ cm

$\tan \theta = \frac{7}{16}$

Power KBAT

1. $\sin x = \frac{CD}{AC}$

$\underset{\cos y}{\text{kos } y} = \frac{BD}{AB}$

$\tan z = \frac{BD}{CD}$

2. $\text{kos } \angle QPS = \frac{5}{13} = \frac{5 \times 2}{13 \times 2} = \frac{10}{26} = \frac{\text{sisi bersebelahan}}{\text{hipotenus}}$

$\cos \angle QPS = \frac{5}{13} = \frac{5 \times 2}{13 \times 2} = \frac{10}{26} = \frac{\textit{adjacent side}}{\textit{hypotenuse}}$

Maka/ *Hence*, $\angle PSQ = 90°$

dan/ *and* $\angle SQR = 90°$ ← sudut selang-seli / *alternate angles*

$QS = \sqrt{26^2 - 10^2}$

$= \sqrt{576}$

$= 24$ cm

$\tan \angle QSR = \frac{32}{24}$

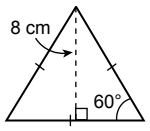
$\angle QSR = \tan^{-1}\left(\frac{32}{24}\right)$

$= 53°8'$

$\angle PSR = 90° + 53°8'$

$= 143°8'$

3.



$\sin 60° = \frac{8}{\text{Panjang sisi/ } \textit{Length of side}}$

$\underset{\textit{Length of side}}{\text{Panjang sisi}} = \frac{8}{\sin 60°}$

$= 9.24$ cm

Perimeter $= 3 \times 9.24$

$= 27.72$ cm