PRACTICE MCQs

CLASS 10 MATHS (TERM - I)

INTRODUCTION TO TRIGONOMETRY

BY

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learning simplified

Question 1:

The value of $(5 \cos^2 60^0 + 4 \sec^2 30^0 - \tan^2 45^0)/(\sin^2 30^0 + \cos^2 30^0)$, is

(a) 15/23

(b) 5/8

(c) 19/45

(d) 67/12

Answer: (d) 67/12

$(5 \cos^2 60^0 + 4 \sec^2 30^0 - \tan^2 45^0)/(\sin^2 30^0 + \cos^2 30^0)$

$= \{5 * (1/2)^2 + 4 * (2/\sqrt{3})^2 - 1^2\}/\{(1/2)^2 + (\sqrt{3}/2)^2\}$

$= \{5/4 + 16/3 - 1\}/(1/4 + 3/4)$

$= \{(15 + 64 – 12)/12\}/(4/4)$

$= 67/12$

Question 2:

A girl walks 200 m towards East and then 150 m towards North. The distance of the girl from the starting point is

(a) 350 m

(b) 250 m

(c) 300 m

(d) 225 m

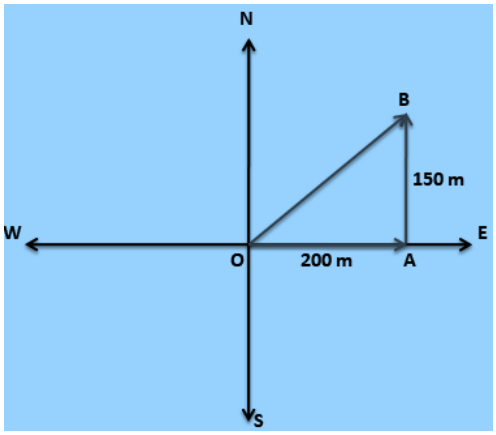
Answer: (b) 250 m

Given, a girl walks 200 m towards East and then 150 m towards North as shown in the figure.

Now, OAB is a right angle triangle right angled at A. We have to calculate the

distance OB.

Using Pythagoras theorem, we have



$OB^2 = OA^2 + AB^2$

$OB^2 = (200)^2 + (150)^2$

$OB^2 = 40000 + 22500$

$OB^2 = 62500$

$OB = \sqrt{(62500)}$

$OB = \sqrt{(625 * 100)}$

$OB = \sqrt{(25 * 25 * 10 * 10)}$

$OB = 25 * 10$

$OB = 250$

Therefore, the distance of the girl from the starting point is 250 m.

Question 3:

The value of $(\sec A + \tan A)(1 - \sin A)$ =

(a) sec A

(b) sin A

(c) cosec A

(d) cos A

Answer: (d) cos A

(iii) $(\sec A + \tan A)(1 - \sin A) = (1/\cos A + \sin A/\cos A)(1 - \sin A)$

$= \{(1 + \sin A)/\cos A\}(1 - \sin A)$

$= (1 - \sin^2 A)/\cos A$

$= \cos^2 A/\cos A$ [Since $\sin^2 \theta + \cos^2 \theta = 1$]

$= \cos A$

Question 4:

The value of $(\cos A – \sin A + 1)/(\cos A + \sin A - 1)$

(a) tan A + sin A

(b) sec A + tan A

(c)cosec A + cot A

(d) None of these

Answer: (c) cosec A + cot A

$(\cos A – \sin A + 1)/ (\cos A + \sin A - 1)$

$= \{(\cos A – \sin A + 1)/\sin A\}/\{(\cos A + \sin A - 1)/\sin A\}$ [divide by sin A]

$= (\cot A – 1 + \text{cosec } A)/ (\cot A + 1 - \text{cosec } A)$

$= \{\cot A + (-1) + \text{cosec } A\}/ (\cot A + 1 - \text{cosec } A)$

$= \{\cot A + \text{cosec } A + \text{cosec}^2 A - \cot^2 A\}/ (\cot A + 1 - \text{cosec } A)$

$= \{\cot A + \text{cosec } A + (\text{cosec } A - \cot A) (\text{cosec } A + \cot A)\}/ (\cot A + 1 - \text{cosec } A)$

$= \{(\text{cosec } A + \cot A) (1 - \text{cosec } A + \cot A)\}/ (\cot A + 1 - \text{cosec } A)$

$= \text{cosec } A + \cot A$

Question 5:

If $2\sin^2\beta – \cos^2\beta = 2$, then β is

(a) 0°

(b) 90°

(c) 45°

(d) 30°

Answer: (b) 90°

Given, $2\sin^2 \beta – \cos^2 \beta = 2$

$\Rightarrow 2(1 - \cos^2 \beta) – \cos^2 \beta = 2$

=> $2 - 2\cos^2 \beta - \cos^2 \beta = 2$

=> $2 - 3\cos^2 \beta = 2$

=> $3\cos^2 \beta = 2 - 2$

=> $3\cos^2 \beta = 0$

=> $\cos^2 \beta = 0$

=> $\cos^2 \beta = \cos 90°$

=> $\beta = 90°$

Question 6:

In ΔABC right angled at B, if tan A= √3, then cos A * cos C- sin A * sin C =

(a) -1

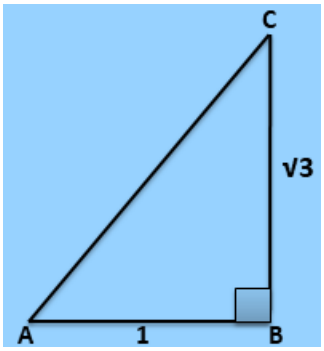
(b) 0

(c) 1

(d) √3/2

Answer: (b) 0

Given, tan A = √3 = √3/1



In Δ ABC, by Pythagoras theorem,

$AC^2 = AB^2 + BC^2$

=> $AC^2 = 1^2 + (\sqrt{3})^2$

=> $AC^2 = 1 + 3$

=> $AC^2 = 4$

=> $AC = \sqrt{4}$

=> $AC = 2$

Now, cos A * cos C – sin A * sin C = (1/2) * (√3/2) – (√3/2) * (1/2)

= (√3/4) - (√3/4)

= 0

Question 7:

If x * tan 45° * sin 30° = cos 30° * tan 30°, then x is equal to

(a) √3/2

(b) 1/2

(c) 1/√2

(d) 1

Answer: (d) 1

Given, x * tan 45° * sin 30° = cos 30° * tan 30°

=> x * 1 * (1/2) = (√3/2) * (1/√3)

=> x = 1

Question 8:

5 $\tan^2$ A – 5 $\sec^2$ A + 1 is equal to

(a) 6

(6) -5

(c) 1

(d) -4

Answer: (a) 6

5 $\tan^2$ A – 5 $\sec^2$ A + 1 = 5 $\tan^2$ A – 5 (1 + $\tan^2$ A) + 1

= 5 $\tan^2$ A – 5 + 5 $\tan^2$ A + 1

= 6

Question 9:

If sec A + tan A = x, then sec A =

(a) $(x^2 - 1)/x$

(b) $(x^2 - 1)/2x$

(c) $(x^2 + 1)/x$

(d) $(x^2 + 1)/2x$

Answer: (d) $(x^2 + 1)/2x$

Given, sec A + tan A = x 1

1/(sec A + tan A) = 1/x

Multiply by sec A - tan A in numerator and denominator, we get

(sec A - tan A)/{(sec A + tan A)(sec A – tan A)} = 1/x

=> (sec A - tan A)/(sec^2A - tan^2A) = 1/x

=> sec A - tan A = 1/x .....2 {Since sec^2A - tan^2A = 1}

Adding equation 1 and 2, we get

sec A – tan A + sec A + tan A = x + 1/x

=> 2 sec A = $(x^2 + 1)/x$

=> sec A = $(x^2 + 1)/2x$

Question 10:

If sin A + sin^2 A = 1, then cos^2 A + cos^4 A =

(a) 1

(b) 0

(c) 2

(d) 4

Answer: (a) 1

Given, sin A + sin^2 A = 1 1

=>sin A = 1 – sin^2 A

⇒ sin A = cos^2 A .....2 [Since sin^2 x + cos^2 x = 1]

Now, $\cos^2 A + \cos^4 A = \cos^2 A + (\cos^2 A)^2$

$= \sin A + \sin^2 A$ [From equation 2]

$= 1$ [From equation 1]

Question11:

If sin A = 1/2 and cos B = 1/2, then A + B =

(a) 0^0

(b) 30^0

(c) 60^0

(d) 90^0

Answer: (d) 90^0

Given, sin A = 1/2

=> sin A = sin 30^0

=> A = 30^0

And cos B = 1/2

=> cos B = cos 60^0

=> B = 60^0

Now, A + B = $30^0 + 60^0 = 90^0$

Question12:

If 4 tan β = 3, then $(4 \sin\beta - 3\cos\beta)/(4\sin\beta + 3\cos\beta)$

(a) 0

(b) 1/3

(c) 2/3

(d) 3/4

Answer: (a) 0

Given, 4 tan β = 3

=> tan β = 3/4

Now, $(4\ sin\beta - 3\cos\beta)/(4\sin\beta + 3\cos\beta)$

$= \{(4\ sin\beta - 3\cos\beta)/\cos\beta\}/\{(4\sin\beta + 3\cos\beta)/\cos\beta\}$

$= (4\ sin\beta/\cos\beta - 3\cos\beta/\cos\beta)/(4\sin\beta/\cos\beta + 3\cos\beta/\cos\beta)$

$= (4\tan\beta - 3)/(4\tan\beta + 3)$

= (4 * 3/4– 3)/(4 * 3/4+ 3)

= (3– 3)/(3+ 3)

= 0

Question13:

If sin A – cos A = 0, then the value of $\sin^4 A + \cos^4 A$ is

(a) 1

(b) 3/4

(c) 2/3

(d) 1/2

Answer: (d) 1/2

Given, sin A – cos A = 0

=> sin A = cos A

=> $\sin A = \sin(90^0 - A)$

=> $A = 90^0 - A$

=> $2A = 90^0$

=> $A = 45^0$

Now, $\sin^4 A + \cos^4 A = (\sin A)^4 + (\cos A)^4 A$

$= (\sin 45^0)^4 + (\cos 45^0)^4$

$= (1/\sqrt{2})^4 + (1/\sqrt{2})^4$

$= 1/4 + 1/4$

$= 1/2$

Question14:

If $\sqrt{2} \sin (60° – x) = 1$ then x is

(a) 15°

(b) 30°

(c) 45°

(d) 60°

Answer: (a) 15°

Given, $\sqrt{2} \sin (60° – x) = 1$

$\Rightarrow \sin (60° – x) = 1/\sqrt{2}$

$\Rightarrow \sin (60° – x) = \sin 45°$

$\Rightarrow 60° – x = \sin 45°$

$\Rightarrow x = 15°$

Question15:

The value of $\sin x /(1 + \cos x)$ is equal to

(a) sec x - tan x

(b) cosec x – tan x

(c) sin x – cos x

(d) cos x – cot x

Answer: (b) cosec x – tan x

We have, $\sin x /(1 + \cos x)$

$= \{\sin x /(1 + \cos x)\} * \{(1 - \cos x)/(1 - \cos x)\}$

= {sin x(1 - cos x)}/(1 – $\cos^2$ x)

= (sin x – sin x * cos x)/$\sin^2$ x

= sin x /$\sin^2$ x – (sin x * cos x)/$\sin^2$ x

= 1/sin x – sin x /cos x

= cosec x – tan x

Question 16:

Math the following:

1. Side opposite to angle θ/Hypotenuse	A. tan θ
2. Side adjacent to angle θ/Hypotenuse	B. sin θ
3. Side opposite to angle θ/Side adjacent to angle θ	C. cos θ
	D. sec θ

(a) 1 –> A, 2 –> C, 3 –> B

(b) 1 –> B, 2 –> C, 3 –> A

(c) 1 –> B, 2 –> C, 3 –> D

(d) 1 –> D, 2 –> B, 3 –> A

Answer: (b) 1 –> B, 2 –> C, 3 –> A

Side opposite to angle θ/Hypotenuse = sin θ

Side adjacent to angle θ/Hypotenuse = cos θ

Side opposite to angle θ/Side adjacent to angle θ = tan θ

Question 17:

If tan α + cot α = 2, then $\tan^{20}\alpha$ + $\cot^{20}\alpha$ =

(a) 0

(b) 2

(c) 20

(d) 2^{20}

Answer: (b) 2

Given, $\tan \alpha + \cot \alpha = 2$

$\Rightarrow \tan \alpha + 1/\tan \alpha = 2$

$\Rightarrow (\tan^2 \alpha + 1)/\tan \alpha = 2$

$\Rightarrow \tan^2 \alpha + 1 = 2 \tan \alpha$

$\Rightarrow \tan^2 \alpha - 2 \tan \alpha + 1 = 0$

$\Rightarrow (\tan \alpha - 1)^2 = 0$

$\Rightarrow \tan \alpha - 1 = 0$

$\Rightarrow \tan \alpha = 1$

$\Rightarrow \tan \alpha = \tan 45^0$

$\Rightarrow \alpha = 45^0$

Now, $\tan^{20} \alpha + \cot^{20} \alpha = (\tan \alpha)^{20} + (\cot \alpha)^{20}$

$= (\tan 45^0)^{20} + (\cot 45^0)^{20}$

$= 1^{20} + 1^{20}$

$= 1 + 1$

$= 2$

Question 18:

The value of $1/(1 + \sin A) + 1/(1 - \sin A)$ =

(a) $2 \sec^2 A$

(b) $2 \cot^2 A$

(c) $2 \operatorname{cosec}^2 A$

(d) $2 \tan^2 A$

Answer: (a) $2 \sec^2 A$

$1/(1 + \sin A) + 1/(1 - \sin A) = \{(1 - \sin A) + (1 + \sin A)\}/\{(1 - \sin A) + (1 + \sin A)\}$

$= 2/(1 - \sin^2 A)$

$= 2/\cos^2 A$

$= 2 \sec^2 A$

Question 19:

If sec θ = 13/12, then the value of cot θ is

(a) 13/5

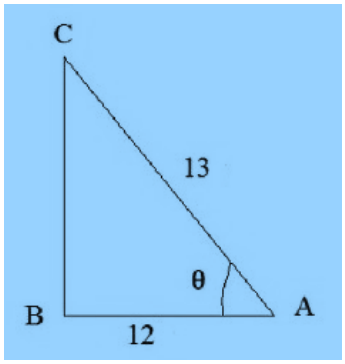
(b) 12/5

(c) 13/12

(d) 1/2

Answer: (b) 12/5

Given, sec θ = 13/12



In Δ ABC, by Pythagoras theorem,

$BC^2 = AC^2 - AB^2$

$\Rightarrow BC^2 = 13^2 - 12^2$

$\Rightarrow BC^2 = 169 - 144$

$\Rightarrow BC^2 = 25$

$\Rightarrow BC = \sqrt{25}$

$\Rightarrow BC = 5$

Now, cot θ = AB/BC = 12/5

Question 20:

If $\sin(A + B) = 1/2$, $\cos(A + B) = 1/2$, $0 < A + B \leq 90^0$, $A > B$ then the value of B is

(a) 60^0

(b) 45^0

(c) 30^0

(d) 15^0

Answer: (d) 15^0

Given, $\sin(A - B) = 1/2$

$\Rightarrow \sin(A - B) = \sin 30^0$

$\Rightarrow A - B = 30^0$ 1

Again, $\cos(A + B) = 1/2$

$\Rightarrow \cos(A + B) = \cos 60^0$

$\Rightarrow A + B = 60^0$ 2

Subtract equation 1 from equation 2, we get

$(A + B) – (A - B) = 60^0 - 30^0$

$\Rightarrow A + B – A + B = 30^0$

$\Rightarrow 2B = 30^0$

$\Rightarrow B = 15^0$

Question 21:

If $1 + \sin^2\alpha = 3 \sin \alpha * \cos \alpha$, then values of $\cot \alpha$ are

(a) -1, 1

(b) 0, 1

(c) 1, 2

(d) -1,-1

Answer: (c) 1, 2

Given, $1 + \sin^2 \alpha = 3 \sin \alpha * \cos \alpha$

$\Rightarrow \sin^2 \alpha + \cos^2 \alpha + \sin^2 \alpha = 3 \sin \alpha * \cos \alpha$ [Since $\sin^2 \alpha + \cos^2 \alpha = 1$]

$\Rightarrow 2\sin^2 \alpha + \cos^2 \alpha = 3 \sin \alpha * \cos \alpha$

Divide by $\sin^2 \alpha$ on both sides, we get

$\Rightarrow (2\sin^2 \alpha + \cos^2 \alpha)/\sin^2 \alpha = (3 \sin \alpha * \cos \alpha)/\sin^2 \alpha$

$\Rightarrow 2\sin^2 \alpha /\sin^2 \alpha + \cos^2 \alpha /\sin^2 \alpha = (3\cos \alpha)/\sin \alpha$

$\Rightarrow 2 + \cot^2 \alpha = 3\cot \alpha$

$\Rightarrow \cot^2 \alpha - 3\cot \alpha + 2 = 0$

$\Rightarrow \cot^2 \alpha - \cot \alpha - 2\cot \alpha + 2 = 0$

$\Rightarrow \cot \alpha(\cot \alpha – 1) – 2(\cot \alpha - 2) = 0$

$\Rightarrow (\cot \alpha – 1)(\cot \alpha – 2) = 0$

$\Rightarrow \cot \alpha = 1, 2$

Question 22:

If $\sin x + \text{cosec } x = 2$, then $\sin^{19} x + \text{cosec}^{20} x =$

(a) 2

(b) 2^{10}

(c) 2^{19}

(d) 2^{20}

Answer: (a) 2

Given, $\sin x + \text{cosec } x = 2$

$\Rightarrow \sin x + 1/\sin x = 2$

$\Rightarrow (\sin^2 x + 1)/\sin x = 2$

$\Rightarrow \sin^2 x + 1 = 2\sin x$

$\Rightarrow \sin^2 x - 2\sin x + 1 = 0$

$\Rightarrow (\sin x - 1)^2 = 0$

$\Rightarrow \sin x = 1$

$\Rightarrow \sin x = \sin 90^0$

$\Rightarrow x = 90^0$

Now, $\sin^{19} x + \text{cosec}^{20} x = (\sin x)^{19} + (\text{cosec } x)^{20} =$

$= (\sin 90^0)^{19} + (\text{cosec } 90^0)^{20}$

$= 1^{19} + 1^{20}$

$= 1 + 1$

$= 2$

Question 23:

Three different coins are tossed together. The probability of getting exactly two heads is

(a) sin A + sec A

(b) cos A + cosec A

(c) sec A + tan A

(d) cot A + cosec A

Answer: (c) sec A + tan A

$\sqrt{\{(1 + \sin A)/(1 - \sin A)\}} = \sqrt{[\{(1 + \sin A)/(1 - \sin A)\} * \{(1 + \sin A)/(1 + \sin A)\}]}$

$= \sqrt{\{(1 + \sin A)^2/(1 - \sin^2 A)\}}$

$= \sqrt{\{(1 + \sin A)^2/\cos^2 A\}}$

$= (1 + \sin A)/\cos A$

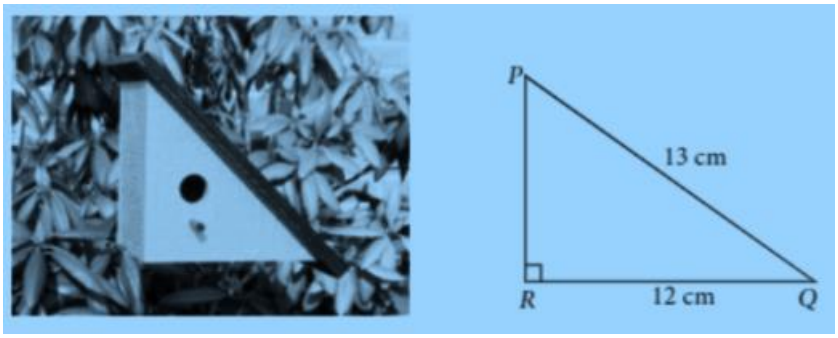
$= 1/\cos A + \sin A/\cos A$

$= \sec A + \tan A$

Case Study Based Questions

Question 24:

Sarla, a student of class 10th, has to make a project on 'Introduction to Trigonometry'. She decided to make a bird house which is triangular in shape. She uses cardboard to make the bird house as shown in the given figure. Considering the front side of bird house as right angle triangle PQR, right angled are R, answer the following questions. [Take ∠PQR = θ]



(i). Find the value of side PR of the triangle PQR.

(a) 5 cm

(b) 6 cm

(c) 7 cm

(d) 8 cm

(ii). The value of cot θ =

(a) 12/5

(b) 13/5

(c) 5/12

(d) 5/13

(iii). Find the value of $\cos^2 \theta - \sin^2 \theta$.

(a) 87/119

(b) 9/119

(c) 119/169

(d) 123/119

(iv). Find the value of $(1 - \tan^2 \theta)/(1 + \tan^2 \theta)$

(a) 87/119

(b) 99/119

(c) 119/169

(d) 123/119

(v). What is the value of angle θ?

(a) $\sin^{-1} (5/12)$

(b) $\cos^{-1} (5/13)$

(c) $\tan^{-1} (12/13)$

(d) None of these

Answers:

(i). (a) 5 cm

Given, PQR is a right angle triangle, right angled are R

Apply Pythagoras Theorem, we get

$PQ^2 = PR^2 + RQ^2$

$\Rightarrow 13^2 = PR^2 + 12^2$

$\Rightarrow PR^2 = 169 - 144$

$\Rightarrow PR^2 = 25$

$\Rightarrow PR = 5$ cm

(ii). (a) 12/5

From the figure,

$\cot \theta = RQ/PR = 12/5$

(iii). (c) 119/169

From the figure

$\cos \theta = RQ/PQ = 12/13$

$\sin \theta = PR/PQ = 5/13$

Now, $\cos^2 \theta - \sin^2 \theta = (12/13)^2 - (5/13)^2$

$= 144/169 - 25/169$

$= (144 - 25)/169$

$= 119/169$

(iv). (c) 119/169

From the figure,

$\tan \theta = 5/12$

Now, $(1 - \tan^2 \theta)/(1 + \tan^2 \theta) = \{1 - (5/12)^2\}/\{1 + (5/12)^2\}$

$= (1 - 25/144)/(1 + 25/144)$

$= (144 - 25)/(144 + 25)$

$= 119/169$

(v). (d) None of these

From the figure,

$\tan \theta = 5/12 \Rightarrow \theta = \tan^{-1} (5/12)$

$\sin \theta = 5/13 \Rightarrow \theta = \sin^{-1} (5/13)$

$\cos \theta = 12/13 \Rightarrow \theta = \cos^{-1} (12/13)$

Question 25:

Two aeroplanes leave an airport one after another. After moving on runway, one flies towards North and other towards South. Their speeds are 400 km/h and 500 km/h respectively. Considering PQ as runway and A and B are any two points in the path followed by two planes, answer the following questions.

(i). Find the value of BP.

(a) 1.2 km

(b) 2.6 km

(c) 3.4 km

(d) 4.4 km

(ii). Find the value of AP.

(a) 2 km

(b) 3 km

(c) 4 km

(d) 5 km

(iii). Find the value of tan A + cot A.

(a) 11/12

(b) 13/12

(c) 19/12

(d) 25/12

(iv). Find the value of sin B + cos B.

(a) 13/17

(b) 19/17

(c) 23/17

(d) 29/15

(v). If ∠APQ = θ then what is the value of tan θ?

(a) 0.25

(b) 0.50

(c) 0.75

(d) 1

Answers:

(i). (c) 3.4 km

BPQ is a right angle triangle, right angled at Q.

Using Pythagoras theorem, we have

$BP^2 = PQ^2 + QB^2$

$BP^2 = (1.6)^2 + 3^2$

$BP^2 = 2.56 + 9$

$BP^2 = 11.56$

BP = 3.4 km

(ii). (a) 2 km

APQ is a right angle triangle, right angled at Q.

Using Pythagoras theorem, we have

$AP^2 = PQ^2 + QB^2$

$AP^2 = (1.6)^2 + (1.2)^2$

$AP^2 = 2.56 + 1.44$

$AP^2 = 4$

$AP = 2$ km

(iii). (d) 25/12

In ΔABD, tan A = PQ/AQ

=> tan A = 1.6/1.2

=> tan A = 4/3

And cot A = 1/tan A = 3/4

So, tan A + cot A = 4/3 + 3/4 = 25/12

(iv). (c) 23/17

In ΔPQB, sin B = PQ/BP

=> sin B = 1.6/3.4

=> cos B = 3/3.4

So, sin B + cos B = 1.6/3.4 + 3/3.4 = 4.6/3.4 = 23/17

(v). (c) 0.75

In ΔAPQ,

tan θ = AQ/PQ = 1.2/1.6 = 3/4 = 0.75

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