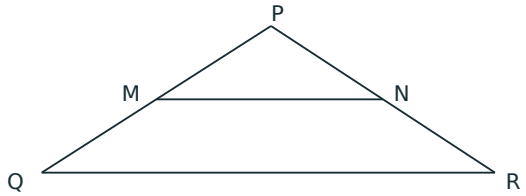
From a drawing to a theorem

Suggested time for the entire exam: 35–50 min; adjust to local conditions.

Name _____ **Date** _____

In triangle PQR, points M and N are the midpoints of PQ and PR. QR is 18 cm long. No right angle is given.



1. Which conclusion follows from the midpoint theorem?

- ○ A MN is perpendicular to QR
- ○ B PQ equals PR
- ○ C MN is parallel to QR
- ○ D Angle P is a right angle

2. Which scale factor maps triangle PQR to PMN by dilation centered at P?

- ○ A 1/2
- ○ B 1
- ○ C 1/4
- ○ D 2

3. Find MN and compare the areas of triangles PMN and PQR. Explain why area changes by that factor.

A cable and a tower

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A straight cable joins the top of a vertical tower to level ground 24 m from its base. The cable makes a 35° angle with the ground. Ignore sag.

4. Which expression gives the height?

- ○ A 24 tan 35°
- ○ B 24 sin 35°
- ○ C 24 cos 35°
- ○ D 24 / tan 35°

5. Which expression gives the cable length?

- ○ A 24 / sin 35°
- ○ B 24 / cos 35°
- ○ C 24 cos 35°
- ○ D 24 tan 35°

6. Without changing tower height, move the ground anchor closer. Predict the change in cable length and ground angle. Justify both.

Circular window

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A sector of a circle has radius 9 inches and central angle 80°. A second sector is similar, with radius 18 inches.

7. What fraction of the first circle is its sector?

- ○ A 4/9
- ○ B 1/9
- ○ C 9/2
- ○ D 2/9

8. What is the area of the first sector?

- ○ A 36π in²
- ○ B 18π in²
- ○ C 4π in²
- ○ D 81π in²

9. Calculate the arc length in each sector. Explain how their ratio compares with the ratio of the two areas.

A classification that needs proof

Use the stimulus and your course knowledge.

Name _____ **Date** _____

Quadrilateral KLMN has consecutive vertices K(0,0), L(4,2), M(3,4), N(−1,2). Use exact coordinates and justify conclusions.

10. Which value is the slope of KL?

- ○ A −1/2
- ○ B −2
- ○ C 1/2
- ○ D 2

11. Which is the midpoint of KM?

- ○ A (1.5, 4)
- ○ B (−0.5, 1)
- ○ C (3, 2)
- ○ D (1.5, 2)

12. Prove KLMN is a rectangle. Then decide whether it is a square. Give enough evidence for each conclusion.