Example 2.1

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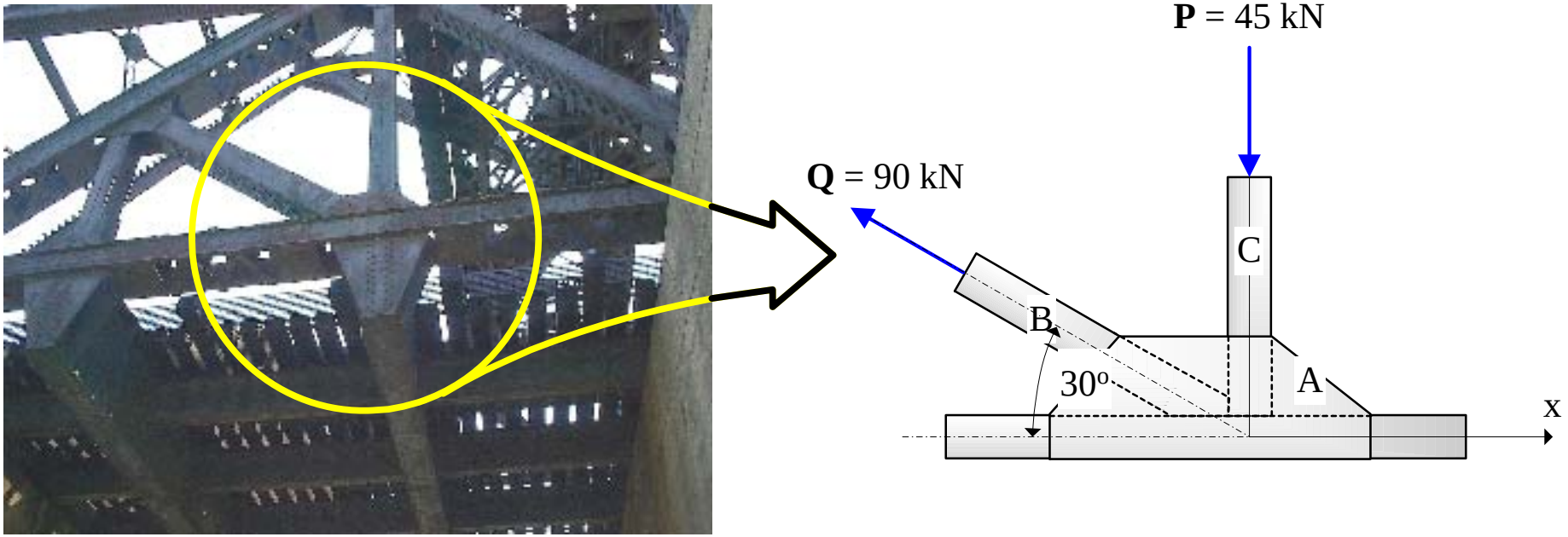
Example 2.1:

Two structural members B and C forming part of a bridge structure over the Red River in Winnipeg are connected to bracket A. Knowing that member B is in tension and member C is in compression, and that **P** = 45 kN and **Q** = 90 kN, determine

(a)graphically by parallelogram or triangle rule the magnitude and direction of the resultant force exerted on the bracket,

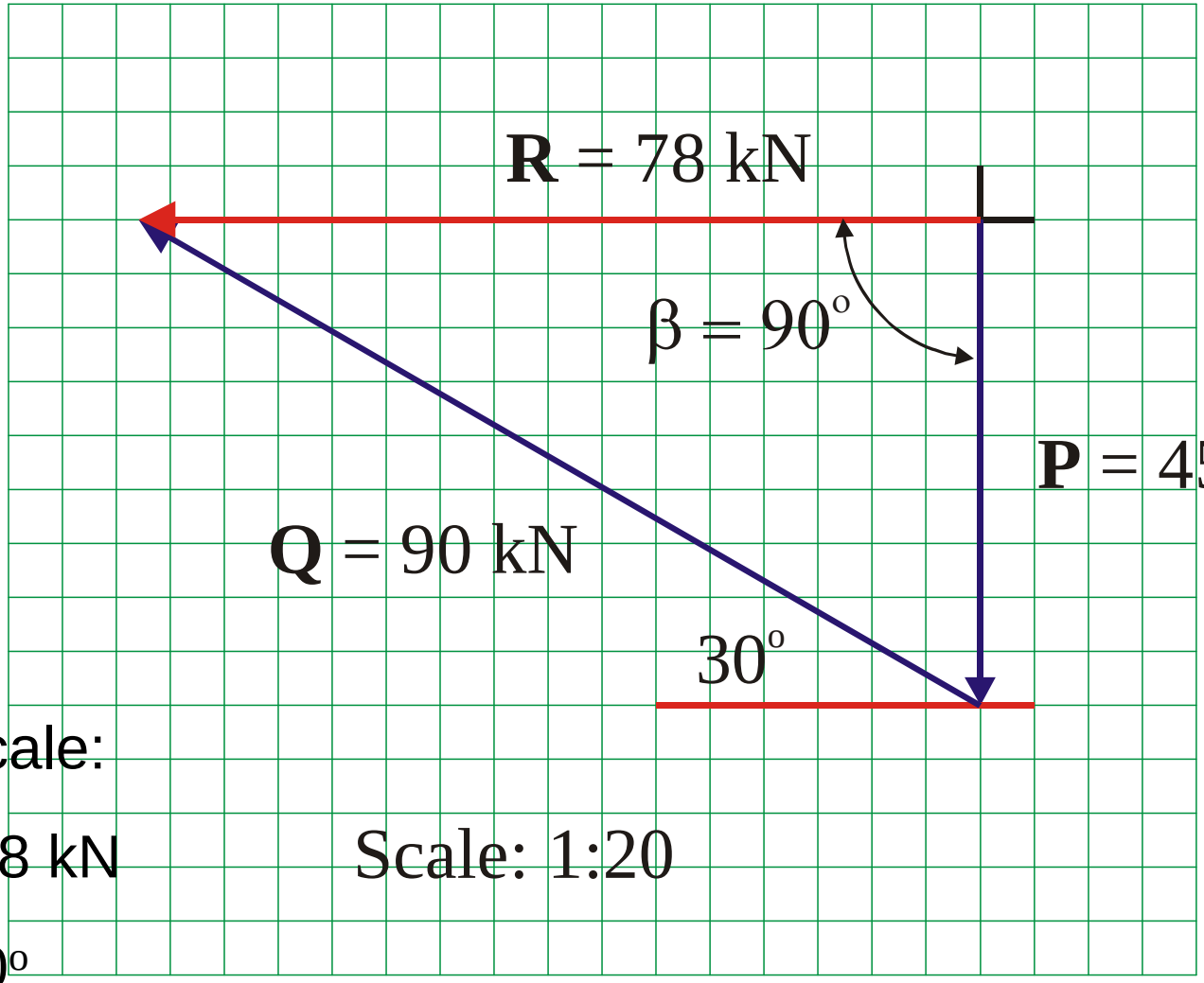
(b)using trigonometry (i.e., sine and cosine laws).



Graphical Solution:

Use the Triangle Rule: Draw **P** and **Q** "Tip-toTail"

Resultant, **R**, goes from "Tail" of **P** to "Tip" of **Q**



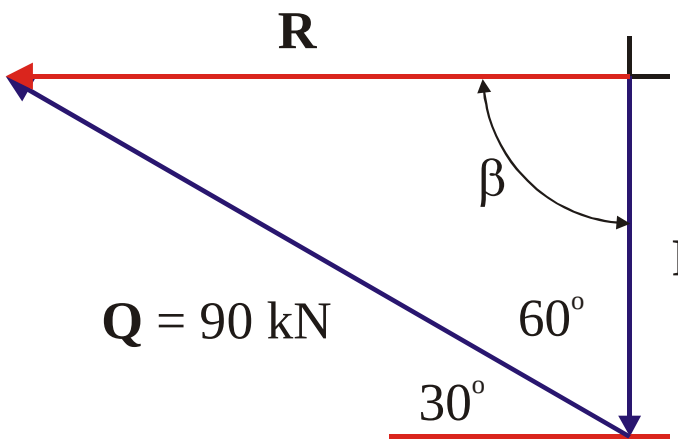
By Scale:

R = 78 kN

β = 90°

Scale: 1:20

Trig Solution:



Use Cosine Rule :

(We know 2 sides and the included angle)

$$R^2 = 90^2 + 45^2 - 2(90)(45)\cos 60^o$$

$$R = 77.94\text{kN}$$

Apply the Sine Rule :

$$\frac{77.94}{\sin 60^0} = \frac{90}{\sin \beta}$$

$$\sin \beta = \frac{90(\sin 60^o)}{77.94}$$

$$\beta = 90^o$$