

Ćwiczenie projektowe nr 6 – opis

Wykresy sił przekrojowych w ramach przestrzennych

Dana jest rama przestrzenna przedstawiona na odpowiednim schemacie:

- wyznaczyć wartości i zwroty reakcji podporowych (nie jest to niezbędne),
- narysować wykresy sił normalnych, tnących (poprzecznych), momentów zginających oraz skręcającego,
- wykresu momentów zginających nie znakować (wykres rysuje się po stronie włókien rzeczywiście rozciąganych),
- sprawdzić równowagę wszystkich węzłów sztywnych ramy.

Projekt numer 6

Zakład Wytrzymałości Materiałów

1 Schematy do projektu numer 6

W tabelach od 1 do 11 zestawiono schematy ram przestrzennych wykorzystywanych w projekcie numer 6 z wytrzymałości materiałów.

Tabela 1. Schematy ram przestrzennych

Numer	Schemat ramy przestrzennej
1	
2	

Tabela 2. Schematy ram przestrzennych - cd

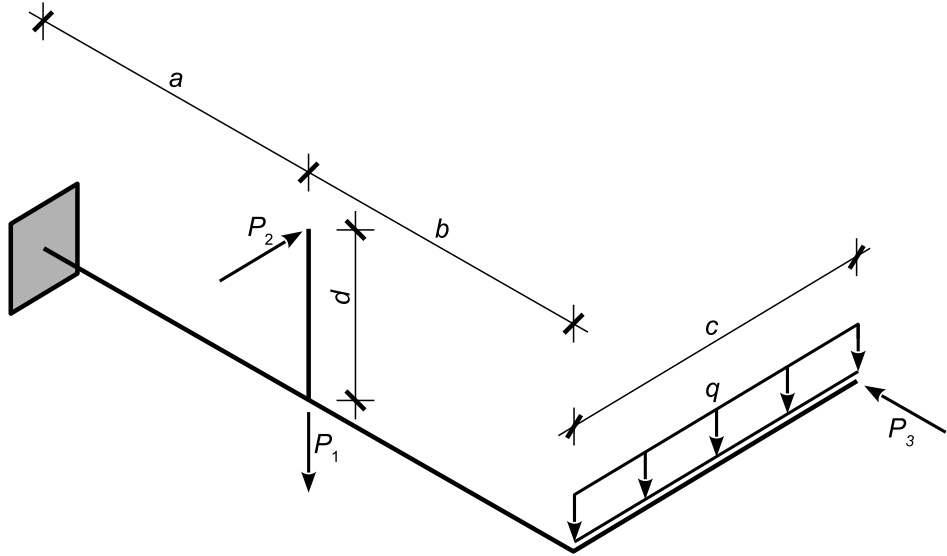
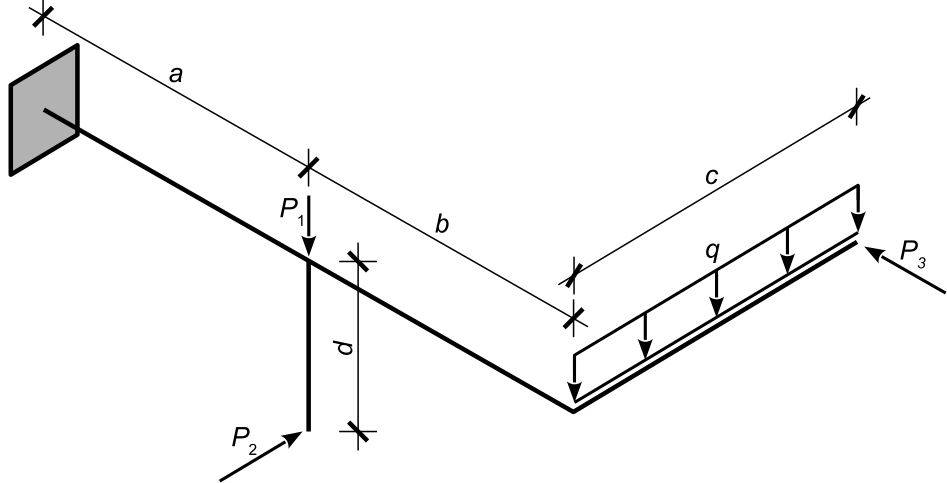
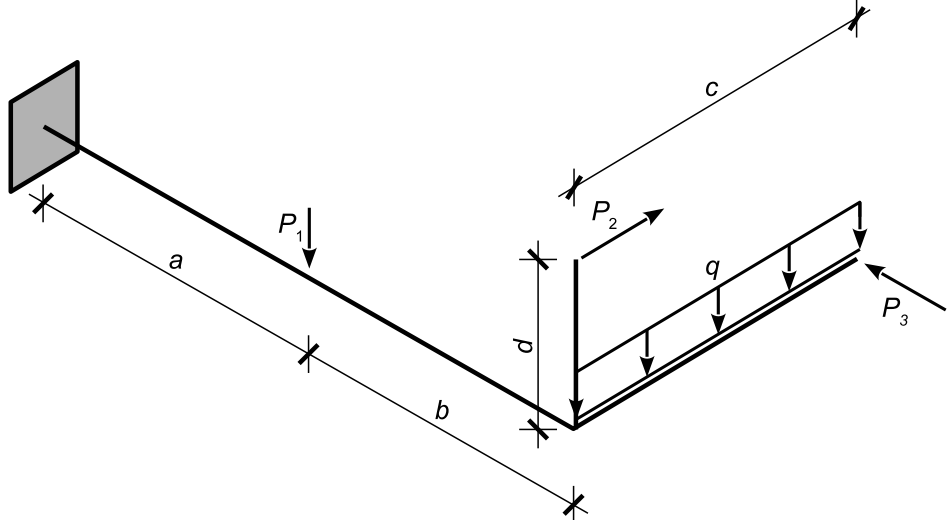
Numer	Schemat ramy przestrzennej
3	 Diagram of a spatial frame (3). The frame consists of a fixed support (grey rectangle) connected to a vertical member of length d. A downward force P_1 is applied at the top of the vertical member, and a horizontal force P_2 is applied at the bottom. The vertical member is connected to an inclined member of length b. The inclined member is connected to a horizontal member of length c. A distributed load q is applied perpendicular to the horizontal member, and a force P_3 is applied at the end of the horizontal member. The dimensions a, b, and c are indicated along the members.
4	 Diagram of a spatial frame (4). The frame consists of a fixed support (grey rectangle) connected to a vertical member of length d. A downward force P_1 is applied at the top of the vertical member, and a horizontal force P_2 is applied at the bottom. The vertical member is connected to an inclined member of length b. The inclined member is connected to a horizontal member of length c. A distributed load q is applied perpendicular to the horizontal member, and a force P_3 is applied at the end of the horizontal member. The dimensions a, b, and c are indicated along the members.
5	 Diagram of a spatial frame (5). The frame consists of a fixed support (grey rectangle) connected to a vertical member of length d. A downward force P_1 is applied at the top of the vertical member, and a horizontal force P_2 is applied at the bottom. The vertical member is connected to an inclined member of length b. The inclined member is connected to a horizontal member of length c. A distributed load q is applied perpendicular to the horizontal member, and a force P_3 is applied at the end of the horizontal member. The dimensions a, b, and c are indicated along the members.

Tabela 3. Schematy ram przestrzennych - cd

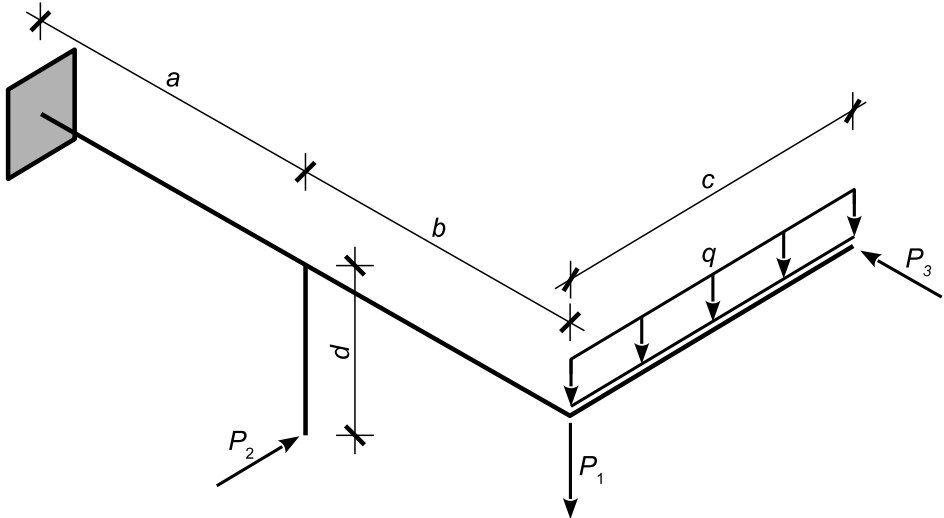
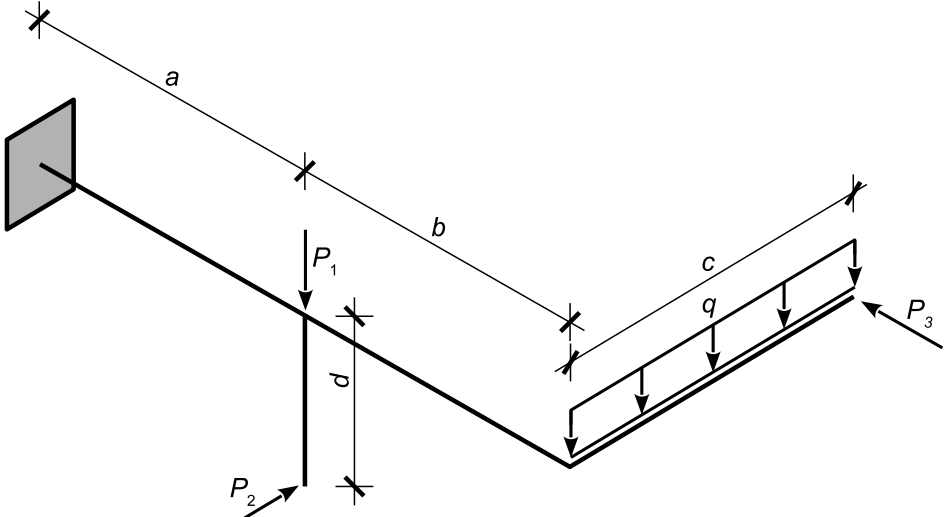
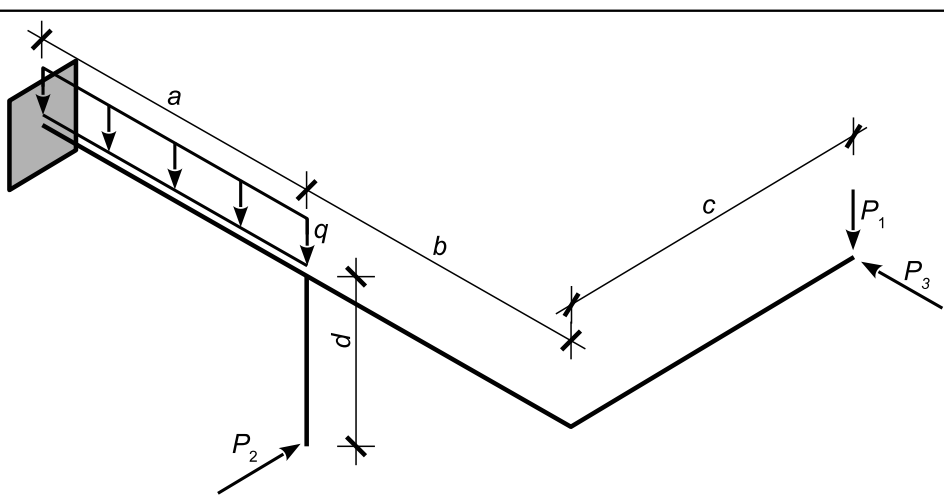
Numer	Schemat ramy przestrzennej
6	
7	
8	

Tabela 4. Schematy ram przestrzennych - cd

Numer	Schemat ramy przestrzennej
9	Diagram 9: A spatial frame with a fixed support at the top left. A horizontal member of length a is subjected to a uniformly distributed load q acting downwards. A vertical member of height d extends downwards from the end of the horizontal member. A diagonal member of length c extends from the bottom of the vertical member to the right. Forces P_1 (vertical, down), P_2 (diagonal, up-right), and P_3 (diagonal, down-left) are applied at the joints.
10	Diagram 10: A spatial frame with a fixed support at the top left. A diagonal member of length a extends downwards and to the right. A vertical member of height d extends downwards from the end of the diagonal member. A horizontal member of length c extends to the right from the bottom of the vertical member. Forces P_1 (vertical, down), P_2 (diagonal, up-right), and P_3 (diagonal, down-left) are applied at the joints. A uniformly distributed load q acts downwards on the horizontal member.
11	Diagram 11: A spatial frame with a fixed support at the top left. A diagonal member of length a extends downwards and to the right. A vertical member of height d extends downwards from the end of the diagonal member. A horizontal member of length c extends to the right from the bottom of the vertical member. Forces P_1 (vertical, down), P_2 (diagonal, up-right), and P_3 (diagonal, down-left) are applied at the joints. A uniformly distributed load q acts downwards on the horizontal member.

Tabela 5. Schematy ram przestrzennych - cd

Numer	Schemat ramy przestrzennej
12	Diagram of a spatial frame (12). The frame consists of a horizontal member of length a, a vertical member of height d, and an inclined member of length c. A distributed load q acts along the horizontal member. Point loads P_1, P_2, and P_3 are applied at the joints. The frame is fixed at the left end of the horizontal member.
13	Diagram of a spatial frame (13). The frame consists of a horizontal member of length a, a vertical member of height d, and an inclined member of length c. A distributed load q acts along the horizontal member. Point loads P_1, P_2, and P_3 are applied at the joints. The frame is fixed at the left end of the horizontal member.
14	Diagram of a spatial frame (14). The frame consists of a horizontal member of length a, a vertical member of height d, and an inclined member of length c. A distributed load q acts along the horizontal member. Point loads P_1, P_2, and P_3 are applied at the joints. The frame is fixed at the left end of the horizontal member.

Tabela 6. Schematy ram przestrzennych - cd

Numer	Schemat ramy przestrzennej
15	
16	
17	

Tabela 7. Schematy ram przestrzennych - cd

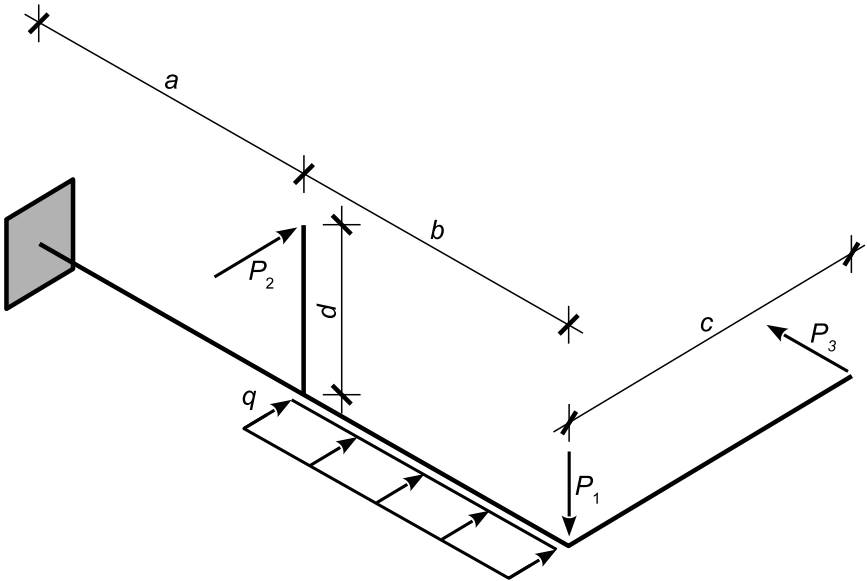
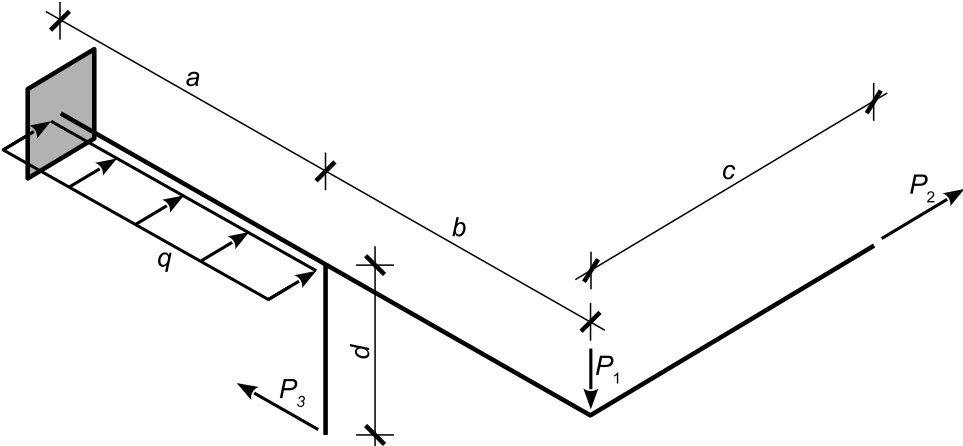
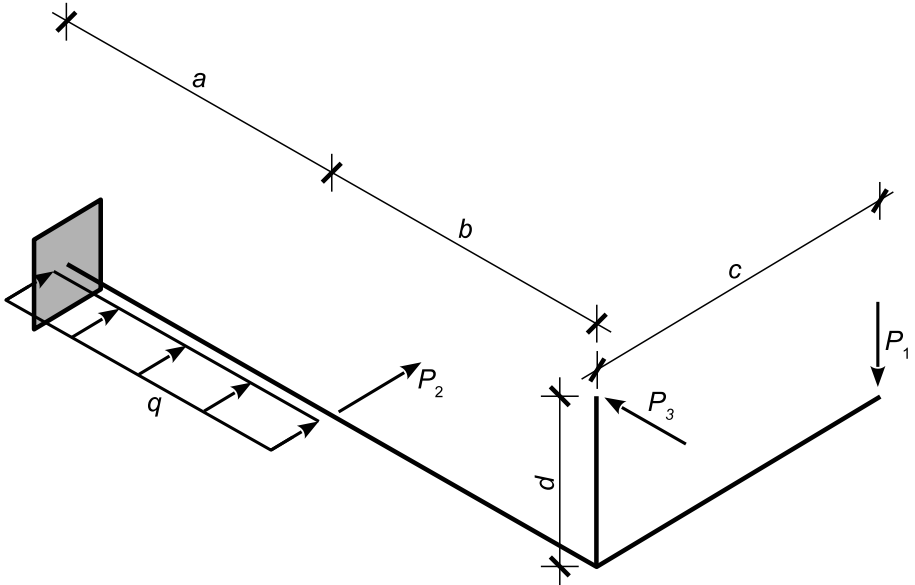
Numer	Schemat ramy przestrzennej
18	 Diagram of a spatial frame structure. The frame consists of a fixed support (gray rectangle) connected to a member of length a. This member is connected to a vertical member of length d. A distributed load q acts along the first member. The vertical member is subjected to a point load P_2. The frame then branches into two members of lengths b and c. The member of length b is subjected to a point load P_1 at its end. The member of length c is subjected to a point load P_3 at its end.
19	 Diagram of a spatial frame structure. The frame consists of a fixed support (gray rectangle) connected to a member of length a. This member is connected to a vertical member of length d. A distributed load q acts along the first member. The vertical member is subjected to a point load P_3. The frame then branches into two members of lengths b and c. The member of length b is subjected to a point load P_1 at its end. The member of length c is subjected to a point load P_2 at its end.
20	 Diagram of a spatial frame structure. The frame consists of a fixed support (gray rectangle) connected to a member of length a. This member is connected to a vertical member of length d. A distributed load q acts along the first member. The vertical member is subjected to a point load P_2. The frame then branches into two members of lengths b and c. The member of length b is subjected to a point load P_3 at its end. The member of length c is subjected to a point load P_1 at its end.

Tabela 8. Schematy ram przestrzennych - cd

Numer	Schemat ramy przestrzennej
21	
22	
23	

Tabela 9. Schematy ram przestrzennych - cd

Numer	Schemat ramy przestrzennej
24	Diagram of a spatial frame (24). The frame consists of a horizontal member of length a fixed to a wall on the left. A distributed load q acts vertically downwards along this member. At the free end of the horizontal member, a vertical member of length b is attached. At the bottom of this vertical member, a diagonal member of length c is attached. A point load P_1 acts vertically downwards at the top of the diagonal member. A point load P_2 acts horizontally to the right at the top of the diagonal member. A point load P_3 acts horizontally to the left at the joint between the vertical and diagonal members. A vertical dimension d is indicated between the horizontal member and the joint.
25	Diagram of a spatial frame (25). The frame consists of a horizontal member of length a fixed to a wall on the left. A distributed load q acts vertically downwards along this member. At the free end of the horizontal member, a vertical member of length b is attached. At the bottom of this vertical member, a diagonal member of length c is attached. A point load P_1 acts vertically downwards at the joint between the horizontal and vertical members. A point load P_2 acts horizontally to the right at the bottom of the vertical member. A point load P_3 acts horizontally to the left at the top of the diagonal member. A vertical dimension d is indicated between the horizontal member and the joint.
26	Diagram of a spatial frame (26). The frame consists of a horizontal member of length a fixed to a wall on the left. A distributed load q acts vertically downwards along this member. At the free end of the horizontal member, a vertical member of length b is attached. At the bottom of this vertical member, a diagonal member of length c is attached. A point load P_1 acts vertically downwards at the bottom of the diagonal member. A point load P_2 acts horizontally to the right at the bottom of the vertical member. A point load P_3 acts horizontally to the left at the top of the diagonal member. A vertical dimension d is indicated between the horizontal member and the joint.

Tabela 10. Schematy ram przestrzennych - cd

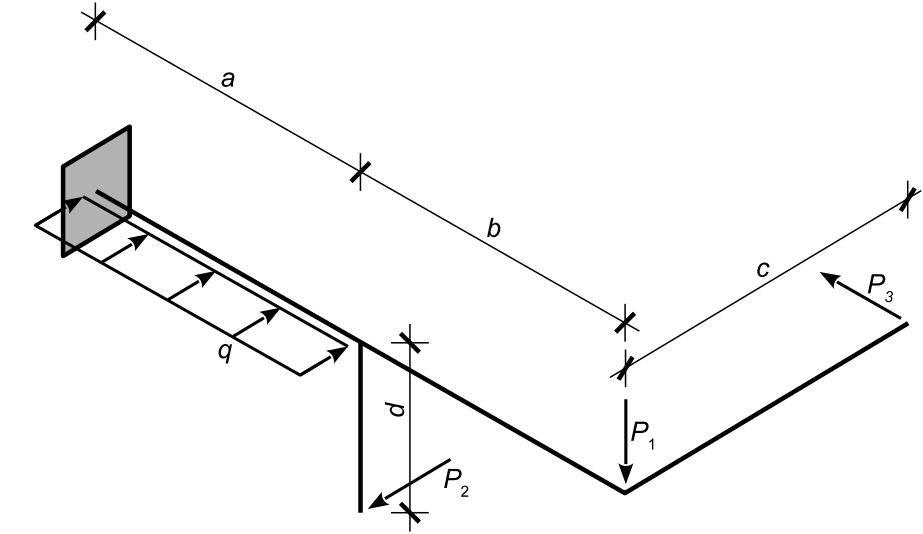
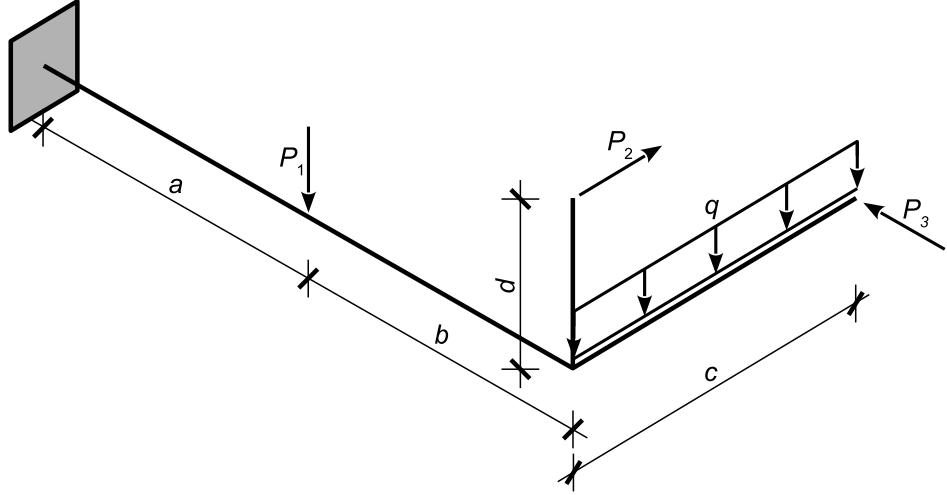
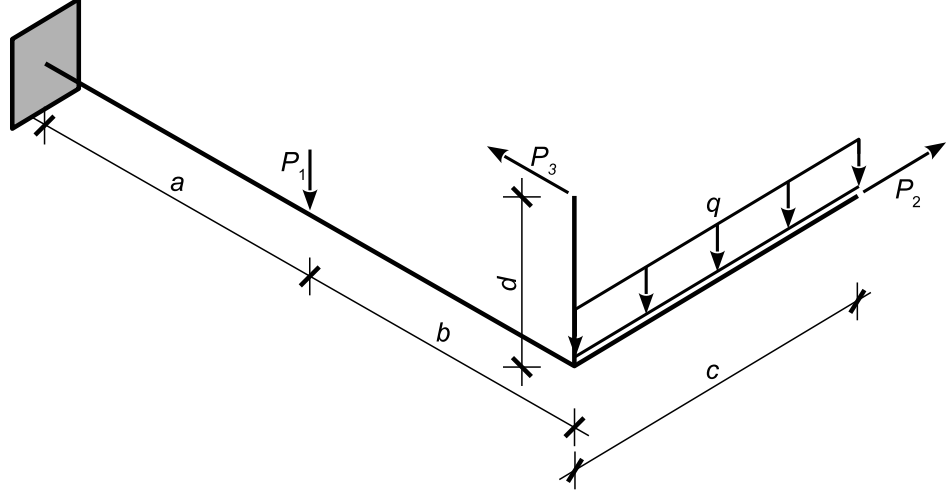
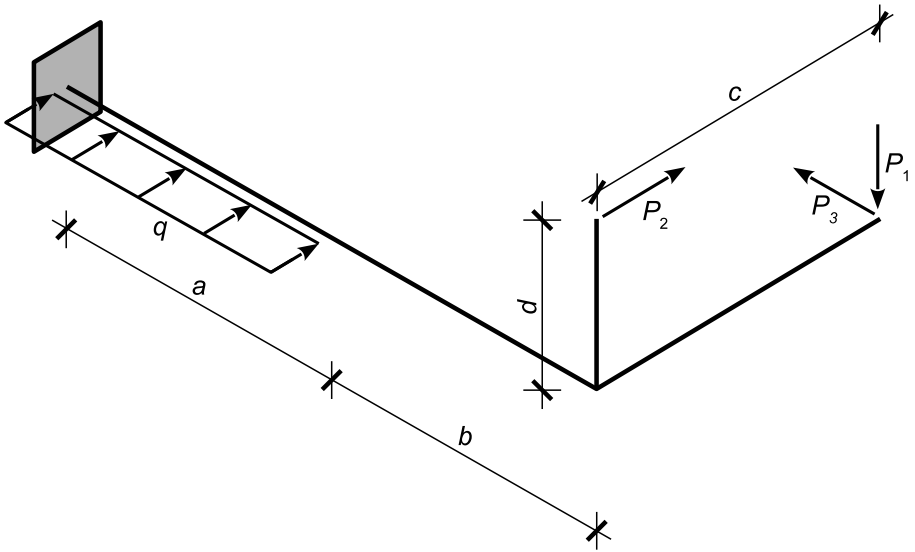
Numer	Schemat ramy przestrzennej
27	 Diagram of a spatial frame (27) with a fixed support. The frame consists of three members: a horizontal member of length a, a vertical member of height d, and an inclined member of length c. A distributed load q acts along the horizontal member. Point loads P_1, P_2, and P_3 are applied at the joints. P_1 is a vertical load at the bottom joint, P_2 is a horizontal load at the vertical joint, and P_3 is a horizontal load at the inclined joint.
28	 Diagram of a spatial frame (28) with a fixed support. The frame consists of three members: a horizontal member of length a, a vertical member of height d, and an inclined member of length c. Point loads P_1, P_2, and P_3 are applied at the joints. P_1 is a vertical load at the horizontal joint, P_2 is a horizontal load at the vertical joint, and P_3 is a horizontal load at the inclined joint. A distributed load q acts along the inclined member.
29	 Diagram of a spatial frame (29) with a fixed support. The frame consists of three members: a horizontal member of length a, a vertical member of height d, and an inclined member of length c. Point loads P_1, P_2, and P_3 are applied at the joints. P_1 is a vertical load at the horizontal joint, P_2 is a horizontal load at the inclined joint, and P_3 is a horizontal load at the vertical joint. A distributed load q acts along the inclined member.

Tabela 11. Schematy ram przestrzennych - cd

Numer	Schemat ramy przestrzennej
30	 The diagram illustrates a spatial frame structure. It begins with a fixed support on the left, represented by a shaded rectangular area. A member extends from this support, with a distributed load q acting perpendicular to it over a length a. This member then continues as a diagonal segment of length b. At its end, there is a vertical member of height d. From the top of this vertical member, another diagonal member of length c extends upwards and to the right. At the free end of this member, three forces are applied: P_1 acting vertically downwards, P_2 acting along the direction of the member, and P_3 acting perpendicular to the member. The entire structure is labeled with the number 30 in the adjacent column.